# The Scientific Review,

AND

# SCIENTIFIC AND LITERARY REVIEW,

A RECORD OF PROGRESS IN ARTS, INDUSTRY, AND MANUFACTURES,

INCORPORATING THE

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## SUBJECT MATTER INDEX OF APPLICATIONS FOR PATENTS.

*July 20th to August 20th inclusive.*

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*** The above List is prepared from the Patent Records by Mr. T. Morgan, Secretary of the Inventors' Patentright Association, Limited.*

Utilisation of the Sun's Rays.—Some practical results appear to have arisen from the experiments of M. Mouchot in utilising solar heat. By means of a large collecting mirror, 12 ft. 6 in. in diameter, and capable of resisting the strongest gale, he has succeeded in raising over 60 pints of water to the boiling point in 80 minutes, and in 1½ hour more produced a steam pressure of eight atmospheres. During one day last March, in Algiers, a horizontal engine was driven at the rate of 120 turns per minute, under a pressure of 3½ atmospheres; and at another trial the apparatus worked a pump, raising at the rate of 264 gallons of water per hour one yard high. The pump was kept going from 8 a.m. to 4 p.m., and neither strong winds nor passing clouds sensibly interfered with its action. M. Mouchot can now readily produce a temperature sufficiently high to fuse various chemical substances, and which can also be used for concentrating syrups and other infusions.

## Reviews.

"Journals and Journalism." London: Field and Tuer, Ye Leadenhalle Presse, E.C.

Bound in the antique style by which other books emanating from this establishment have been characterised, this three-and-sixpenny manual is issued as a guide for literary beginners. Says the author in his preface:—Nearly all our great writers, whether journalists or not, began by contributing timorously and obscurely to the newspaper and periodical press; and that there are thousands of aspirants to-day eager to follow in their footsteps, and to take a place in the Republic of Letters, if they only knew how and where to make a start, is the conviction which has led to the compilation of this book. We feel that "John Oldcastle" has painted the journalistic world in colours far too rosy, and that the impression conveyed to the literary aspirant, after a careful perusal of the book, would be apt to tempt "anyone who can command a table, a chair, pen, ink, and paper to commence trade as a literary man." We would impress on the mind of the beginner a trite sentence which the author uses:—A journalist is bound to be a man of the world, as an author is bound to be a student. These qualifications are rare, but, co-existent with unflinching perseverance and constant industry, their possessor may reasonably hope to gain a high position in the Republic of Letters as he would in any other sphere of action to which he devoted such natural endowments. The general contents of the book embrace many valuable hints, and having at one time ourselves habitually received each week upwards of five hundred "contributions"—from the elaborated first chapter of a series to queries of most trivial import—we most heartily recommend all those who feel that their mission in life is the dissemination of heaven-born truths—in other words, to become journalists, and, indeed, all novices who are prompted to pen an article and send it unasked to an editor—to first purchase "Journals and Journalism," and then, if it must be written, at least to send in the contribution according to the tenets of "John Oldcastle."

"Elements of Chemistry—Theoretical and Practical." By William Allen Miller, M.D., D.C.L., LL.D. Revised and in great part re-written by Henry E. Armstrong, Ph.D., F.R.S., Sec. Chem. Soc., and Charles E. Groves, F.C.S., Sec. Inst. Chem. Part III., Chemistry of Carbon Compounds or Organic Chemistry. Section 1: Hydro-carbons, Alcohols, Ethers, Aldehydes, and Paraffinoid Acids. Fifth Edition. London: Longmans, Green, and Co. 1880.

The science of chemistry strides along at such a pace that it is difficult to keep up with the almost daily discoveries which are being made; and in illustration of this fact we take the volume under consideration as an example. This volume comprises Section 1 of Part III. of Miller's "Elements of Chemistry," bearing on organic chemistry, and by way of exposition of its scope and contents we might observe that this one section is greater in bulk than the whole of the third part in the last edition. We can do no better, to show the various improvements made by the present editors, than quote their prefatory words:—

"A comparison of this edition with the previous one published in 1869 will render it evident that the present volume is practically a new treatise, more than four-fifths of the whole having been re-written. The rapid development of that branch of physical science which comprises the carbon compounds rendered a change necessary in the system of classification employed by the late Professor Miller, and the adoption of one based on the analogy in chemical constitution and properties of compounds rather than on the source from which they happen to be obtained. At first an attempt was made simply to re-arrange and enlarge the work, so as to include the more important discoveries made since the issue of the last edition, but this had soon to be abandoned as impracticable. It therefore became necessary to re-write the treatise, incorporating those portions of the original available for the purpose."

The above quotation will show the extent of variations from the last edition, and we may add that this section of the work has been brought up to the present state of knowledge. We can only say that the intentions of the editors in our opinion have been carried out, and though there may be some omissions, yet the work as now presented gives us the latest discoveries and processes in the science of organic chemistry. To the advanced student this volume will be a welcome addition to his library. The editors express a wish that their readers will point out any mistakes they may notice, and further, they will gladly welcome any suggestions or information. Communications on these points to be addressed to Dr. Armstrong. We trust this invitation will be well responded to, in which case we shall, doubtless, judging from the completeness of the present work, hereafter be placed in possession of the most complete work on the subject that can possibly be obtained.

"Elements of Astronomy." By Robert Stawell Ball, LL.D., F.R.S., Royal Astronomer of Ireland. London: Longmans, Green, and Co. 1880.

This volume forms another of the series of Text-books of Science, the merits of which series we have before had occasion to speak, and the one now before us will compare very favourably with those previously issued. The work, although mainly intended for beginners with some knowledge of mathematics, will be found of great service to advanced students and to others who delight in investigating the mysteries of the heavens.

It would be difficult for us to quote from the volume, for to do anything like justice in this way would go beyond the space at our command; therefore we content ourselves by stating that to students it will be found of great service; further, we may remark that as the volume is not overcrowded with mathematical formulæ, it can be read with profit by those who take interest in the study of astronomy.

"Calvert's Catalogue of Books." Manchester: John Calvert, 99, Great Jackson-street.

This catalogue is a comprehensive list of books on technology and applied science, selected from the catalogues of all publishers, and forming an index of all works published relating to civil and mechanical engineering, building construction, trades, manufactures, and professions, the arts, and practical industrial science in general; each subject is relegated to its particular section, and it is thus easy to see at a glance the title and an epitomised summary of contents, together with the price of all works relating to any branch of industrial art. The catalogue contains upwards of one hundred pages, and costs but sixpence. We can cordially recommend it to all interested in self-educatin.

### NEW BOOKS.

"Animal Magnetism," Physiological Observations. Translated from the German. 12mo., pp. 122.

"Casting and Founding," practical treatise on: including the modern machinery employed in the art. 2nd edition, 8vo., pp. 424.

"Brain Work and Over Work." 8vo, pp. 122.

"Breweries and Maltings:" their arrangement, construction, plant, and machinery. 2nd edition, revised, enlarged, and partly re-written, 8vo, pp. 186.

"Elements of Astronomy." 12mo., pp. 474.

"Morals of Evolution." 8vo., pp. 135.

"Introductory Reader to Geology." 8vo., pp. 260.

"The Marine Engineer." 2nd edition, 8vo., pp. 258.

"The Minor Arts:" porcelain, painting, wood carving, stencilling, modelling, Mosaic work, &c. 8vo., pp. 168.

"The Mythology of Greece and Rome," with special reference to its use in the arts. New and revised edition, 12mo., pp. 270.

"Popular Dictionary of Architecture and the Allied Arts." Vol. I., 8vo., pp. 301.

"Handbook for Writers and Readers," containing blunders corrected, dictionary of synonyms, and classical dictionary. 32mo.

### WHAT IS CIVILISATION?

In reviewing a book recently written by Dr. Arthur Mitchell, M.D., LL.D., the *Athenæum* says:—

"In 1876 and 1878 Dr. Mitchell delivered two courses of Rhind Lectures on archæology, which he has now published under a somewhat clumsy double title, one half of which represents the main subject of each course. But the two series run together far more smoothly than their titles would seem to imply, and form, in fact, an organic whole. The thread which binds them together is the author's belief in a relatively fixed and constant human intelligence. It has been the habit of archæologists, and especially of prehistoric archæologists, of late years to accept that theory of human development which represents men as the descendants of a low primitive type, little gifted intellectually or emotionally. Dr. Mitchell comes forward as the champion of an older and now less popular view, that man has always been much the same as we see him at present. From the very first, he argues, human beings seem to have been endowed with just the same faculties and potentialities as at the present day. The earliest known human skulls, he asserts, are just as human, and apparently betoken just as much intelligence, as those of civilised men in our own time. The differences are not differences of type, they are merely differences of social organisation. A savage differs from an average European mainly in the fact that his society is less highly organised than that of France or England. Civilisation is a matter of social arrangement, of distribution of parts, not a matter of individual superiority. Culture is strictly personal, but civilisation is general: you cannot fairly say that a man is civilised, though you may say that he is cultivated; and you cannot fairly say that a community is cultivated, though a small proportion of its members may be so. These are the central ideas of Dr. Mitchell's work, and they are enforced with an amount of learning, original research, and acute reasoning which makes every page full of interest alike for the scientific anthropologist and the general reader. Dr. Mitchell is the able, cultivated, and fully equipped defender of what seems to be a losing cause.

It would be an injustice to his work, however, to represent it as dealing merely with such abstract questions in their naked form. On the contrary, the subject is treated with a great wealth of concrete illustration, and glows with colour from beginning to end. The facts are first marshalled in array without a word of comment, and then the inferences to be drawn from them are unexpectedly set forth in a clear and often startling light. Dr. Mitchell's researches have led him to investigate the curious relics of the past which still linger so abundantly in the remote north and west of Scotland. There he finds a race of men, amongst the acutest in intellect of the Keltic and Scandinavian stocks, yet using implements in many cases as rude as the palæolithic age. In the Shetlands old women still employ the spindle and the whorl, exactly as their ancestors employed them four thousand years ago, the only difference being that modern whorls are far less ornate than their antique predecessors. Near Inverness a potato does duty instead of a stone or clay whorl. At Barvas, in the island of Lewis, the people manufacture home-made pottery without a wheel, as rude as the rudest ever discovered among the relics of the stone age or in use among modern savages. Yet the inhabitants of Barvas are not clothed in skins and eaters of raw flesh; 'in intellectual power and in their mode of living they are just what their neighbours are.' Manchester cottons, Staffordshire crockery, Sheffield cutlery, West Indian sugar, and Chinese tea may be found in the self-same cottages where these primitive jars and bowls are fashioned. Thus the very rudest arts may co-exist in a single community side by side with the most advanced. Similarly the 'Norse mills' of Shetland are the simplest and most ineffectual application of water power known amongst men; yet they answer the purpose of their makers well enough, because water power is abundant, and there is no need to economise it by such cunning inventions as overshot wheels. The bee-hive houses of the Hebrides form another example of a surviving archaic type, equally out of keeping at first sight with our existing civilisation. The rough bone buttons, the stone beds, the one stilted ploughs, the wheelless carts, dragged along upon their tilted beams, and the bismar or rude steelyard used in many parts of Scotland give rise to similar reflections. But the strangest instance of all is the all but modern stone implements found in Shetland. These consist of rough flint flakes, shaped by chipping, and quite recently used as knives or hatchets. So far as mere external appearance goes, they might be implements from the drift, were it not for the absence of that peculiar weathered appearance which is the distinguishing mark of genuine palæolithic specimens. The pre-glacial flints are discoloured for about a quarter of an inch from the surface, and display a banded outline when fractured. The Shetland implements, on the contrary, are apparently all but modern, and are found under circumstances which do not seem to imply any remarkable antiquity.

From all these examples, Dr. Mitchell draws the general conclusion that primitive man, or, at any rate, the man of the stone age, may have been really equal in intellectual powers to ourselves. Here in modern Scotland we find arts as rude as those of the palæolitic period side by side with an intelligence fully equal to the average of London or Manchester. May it not be, he suggests, that the race has progressed in organisation alone, not in actual capacities? Have we any evidence for a progress in ability as distinguished from mere results of increased co-operation? These subjects are treated in the second series of lectures, which deals with the question, What is civilisation? Dr. Mitchell believes that it consists in a sort of bond or compact to defeat the action of natural selection, and the degree of success attained in the struggle is the measure of the civilisation reached in each case. It is just as probable that savages are degraded forms of humanity as that the civilised man is an elevated form. Dr. Mitchell very ingeniously employs arguments derived from Mr. Wallace and Mr. Herbert Spencer to support these views, and he manages to do so with a delightfully *naïve* and unconscious air, as though he fully expected Mr. Spencer to accept his conclusions. But indeed the whole book is a masterpiece of sceptical iron, wielded in the interests of doctrines exactly opposite to those which its premises have usually been held to prove. From this point of view its originality and literary skill are beyond all praise.

At the same time it cannot be allowed that Dr. Mitchell has by any means proved his case. It is not so easy for a single volume to overthrow the whole body of doctrine based upon the researches of Mr. Darwin, Sir John Lubbock, Mr. Tylor, and a thousand other independent investigators. Dr. Mitchell does not even pretend to do so; he advances his doubts under the modest guise of suggestions or hints rather than in the form of deliberate and settled convictions. He inquires and hesitates where others assert, and by so doing he arouses honest doubts where mere assertion would have aroused nothing but opposition. Nevertheless, he often mistakes his ground. Like a great many other archæologists, he talks a little loosely about 'the stone age,' without usually distinguishing between the palæolithic and neolithic periods. In other words, he lumps together two epochs separated from one another by a vast interval of time, and having nothing in common except the mere accidental resemblance that in both stone was employed as a material for weapons. Misled by this vague expression, he goes on to make statements about the so-called primitive man which will hardly bear scientific investigation. We know that the skulls of the neolithic men, who were mere modern savages of yesterday, are not a whit inferior to the average skulls of any other savages, or, for the matter of that, to nine out of ten skulls that we see about us in Europe. But we know next to nothing about the skulls of the vastly earlier palæolithic men, and we cannot pronounce with certainty from such fragmentary evidence upon the question whether they were or were not a trifle more brute-like than our own. Moreover, it is admitted on all sides that the cave-men were essentially men, and men of a comparatively high type, quite as high as many existing savages or even a little higher. There can be little doubt that they were intellectually superior to the Australians and the Fuegians, if they were not even equal to the Eskimo. Therefore it is quite certain that we cannot in any way regard them as a 'missing link,' or at least we must look upon them merely as the penultimate link in a long chain, whose other links are many and wanting. But it does not follow, because palæolithic man was relatively high in development, that 'primitive' man was so. Granting for a moment the general truth of Mr. Darwin's views, there is no reason why the quadrumanous stock which ultimately produced mankind may not have begun to differentiate itself from the remainder of the primates as early as the Pliocene, or the Miocene, or even the Eocene time. The fact that man was already essentially man in the drift period does not militate any more against his supposed development from a lower form than does the fact that he is essentially man in the nineteenth century. The creatures which produced the fire-split flints in the Miocene, discovered by the Abbé Bourgeois, may have been 'missing links,' or they may have been as decidedly men as the chippers of the Abbeville hatchets; but in any case the reasons for believing that man derives his origin from a lower type remain the same. We are not bound to accept any particular date for the evolution of humanity. Dr. Mitchell's suggestion seems on the whole beside the mark; they do not really touch the question at issue at all. At times, too, the author rather under-estimates the strength of the adverse evidence; for example, it can hardly be denied that many existing savages have capacities (as distinguished from realised powers) far below those of civilised men, and that while some savages seem capable of receiving civilisation, others seem hopelessly below it. Nevertheless, though Dr. Mitchell perhaps fails in making good his case, his book will be a useful caution against rash conclusions, and will cause many anthropologists seriously to reconsider not a few among their hasty generalisations. It comes as a wholesome disturbance to a somewhat dogmatic peace, and it is too honest and fearless to do anything but good to the science with which it deals. Perhaps we have all been too apt to acquiesce passively in the notion that the man of the early stone age was the primitive man, and that he was necessarily inferior in intelligence even to the lowest modern savages. Dr. Mitchell's book certainly casts the burden of proof upon the shoulders of those who assert such an inferiority rather than on the shoulders of those who reject it."

## MANCHESTER SCIENTIFIC AND MECHANICAL SOCIETY.

THE members of the above society on Friday, the 6th ult., paid a visit to the Manchester, Sheffield, and Lincolnshire Railway Company's locomotive works at Gorton, near Manchester, which had been kindly thrown open to their inspection, and the splendid machinery contained in the establishment, which gives employment to about 3,000 mechanics and labourers, exclusive of locomotive drivers and the office departments—numbering about 500 additional *employés*—rendered the visit one of considerable interest. The members were first shown through the rolling mill department, where the Bessemer 3-ton plant and the patent re-heating furnace invented by Mr. Perkins, the manager of the works, were seen in operation. The Perkins furnace is probably pretty well known, but it may be stated that the object attained is the heating of the air before it enters the hearth. The hot air is made to come into contact with the combustible gases after leaving the fire-grate and in contact with the metal being heated, by which means an enormous saving of fuel is effected. The permanent way department was next visited, and here was seen the manufacture of spikes and fish-bolts and the fitting up of points and crossings. The party, having passed through the coppersmiths' shops, brass foundry and pattern shop, proceeded to the foundry, and here the rapidity with which railway chairs were being cast excited considerable astonishment, one man and a boy being able to cast 1,100 chairs per day. The branch of the works, however, which presented the most interest to the members was the heavy machinery department, and the various machines here employed, although probably possessing no very special features as compared with those to be seen in other large locomotive works, were yet of such a character as to deserve considerable attention. The slotting machinery in this department was particularly good, and one machine for cutting out the under framework for locomotives may be particularly noticed. This was what may be termed a heavy frame machine, with three heads, driven by friction gearing, and having three automatic transverses for the tools. By this machine no less than six frames, each one inch thick, and bolted together, are cut through simultaneously. There was also a quadruple boring machine for axle-boxes, eccentrics, sheaves, &c., by which one man and a boy are enabled to perform the work of three large lathes. Amongst the other machines were a number of excellent wheel-turning lathes and hydraulic lifts for removing the heavy locomotive wheels to and from the shop. Above this department was the fitting shop, and amongst the novelties seen here were bushes for outside rods, which are cast to size in chill, and are then ready for being placed in without any tool work whatever. These bushes are cast by this method in various sizes to meet the requirements of worn-out crank-pins, a supply being kept in stock for any necessities that may arise through breakdowns, and the unworked surfaces are considered to be better than those which have been tooled. The new erecting shops which were next visited were fitted up with all the modern improvements, the engine being lifted bodily from the rails by four powerful travelling cranes, one of which at the time of the visit was employed drawing the boiler out of a locomotive which had been sent in for repairs. In the smiths' shop wheels and other forgings were seen in construction, and the visitors were also shown a disused running shed which is being converted into a smiths' shop with twenty-four fires, a new locomotive running shed for 120 engines having just been erected. The boiler shop was next visited, and here a small portable machine for rhyming and screwing the holes of fire-boxes in position was seen in operation. This is a small machine held in the hands of the workman, and, by means of an adjustable band connected with the running shaft in the shop by which it is worked, is readily brought into operation at any point where it is required. It had been intended to inspect also the carriage department, but so much time had been occupied with the locomotive portion of the works that it was decided to postpone any further inspection until a future visit.

## SHELL-LAC CULTIVATION.

Our supplies of shell-lac, or, as it is more commonly written, shellac, are derived almost exclusively from India, where its collection and preparation give employment to a considerable number of natives. It is the product of an insect, deposited on the twigs of trees, partly as a defence for the eggs over which it is incrusted, and partly as a food for the young larvæ. These twigs are collected, and generally, for convenience of transport, brought to market cut up in lengths of two or three inches, called "stick-lac." They then undergo various processes, the objects of which are, first, to separate the resinous incrustation from the wood; secondly, to free this resin from the colouring matter which it contains; thirdly, to convert the resin into what is known as "shellac;" and, fourthly, to form the colouring matter into cakes of dye known as "lac-dye." In the course of manufacture it is known by various names: When the lac is separated from the wood it is called "seed-lac;" this, melted and formed into cakes, becomes "lump-lac;" and, when again melted and transformed by a curious process into thin, brittle sheets or flakes, takes the form and name by which it is generally known of shell-lac. To "seed-lac" an interest has lately been imparted, not anticipated when the first was employed, the seed-lac being used actually as seed for the cultivation of lac in districts where it is not indigenous. The officers of the Forest Department of India according to the *Colonies and India* have discovered that by judiciously applying the seed-lac to suitable trees the insect can be made to take up its home in new localities. This transplanting of the insect can also be effected by bodily transplanting the trees on which the eggs and lac are deposited, or by removing the twigs with their lac covering to the place selected for the cultivation of the product. In this way the lac industry is being spread over many new parts of India; and it is found that great economy in the cost of collection is achieved, since the material can be produced in large quantities in a comparatively small district, instead of being searched for over large forest areas as at present. The value of lac annually exported from India, which a few years ago was barely £200,000, is now nearly three-quarters of a million sterling.

## Correspondence.

*We do not hold ourselves responsible for or necessarily endorse the opinions expressed. Whatever is sent for insertion must be authentic cated by the name and address of the writer, not necessarily for publication, but as a guarantee of good faith.*

### EXPLOSIONS IN COAL MINES.

TO THE EDITOR OF THE SCIENTIFIC AND LITERARY REVIEW.

Sir,—Your correspondent "H. B." opens up for discussion an important subject with which is involved not only an immense capital, but the lives of thousands. Mr. William Young, who has given much time to the study of the causes which produce the disastrous explosions in collieries, publishes a small pamphlet on the subject, which may be had from Messrs. Archer and Sons, the publishers, Wellington-place, Belfast, and a perusal of which would probably interest "H. B."—I am, &c.,

C. G. F.

**Churning by Goat Power.**—The most striking feature of the dairy ranch of F. S. Clough, in San Mateo canyon, is the new dairy house which Mr. Clough recently completed at a cost of 1,500 dols. It is 18 ft. by 36 ft. in ground dimensions, finished externally in rustic style, and inside is as trim as the thrifty housewife's "best room." The butter room, an apartment 10 ft. by 15 ft. in dimensions, is carpeted (!) and as inviting as a parlour. The apparatus for handling the milk and making the butter is complete in every detail, and is designed throughout for the saving of labour. A receiving vessel, fitted with a strainer, is located in the milking yard, and communicates by a pipe with the dairy house. The milkers pour their milk into this receiver and that is the end of their duties. The milk passes down through the pipe to a 200 gallon tank in the dairy house, whence it is drawn by the dairymen, undergoing, meanwhile, a second straining process. It is then placed in pans to cool and raise the cream. Water is brought in pipes through the house from a mountain spring. The churn holds 52 gallons of cream and turns out from 100 lb. to 120 lb. of butter at each churning. It is worked by goat power, the appliances being a treading wheel 18 ft. in diameter, which connects with and operates a shaft running into the dairy house, and this in turn connecting with cog wheels working the dashers. Mr. Gow says that the goats in operating the wheel, indulge in their natural propensity for climbing, and they apply themselves to the work with great gusto. The herd consists of some eight or ten animals, ranging from the grandmother and old Billy with the whiskers, down to the youngling not over a foot high. When released from their pen they one and all, great and small, run bleating for the wheel, and the only trouble to contend with thereafter is the excess of power which they are apt to give it in the course of their frolicsome gambols.—*Los Angelos* (Cal.) *Express.*

**Acetic Acid from New Zealand.**—A new industry has been started at Christchurch, New Zealand, the distillation of acetic acid, thereby utilising the timber cleared. One cord of wood will produce 36 gallons of crude acid, worth in England about 1s. 6d. per gallon.

**Celluloid for Stereotyping.**—A new process for obtaining stereotypes for printing has been discovered by M. Emile Jannin, a sculptor of Paris, who proposes to employ celluloid for that purpose. The process of preparation takes only halt an hour when the types are once set up, and the plates produced are suitable for working on cylinder machines running at a high speed, being very light, flexible, and durable. In this last respect they surpass metal plates, affording, it is said, 50,000 impressions.

**A New Screw.**—It is a well-known fact that the great bulk of the screws used in the commonest kinds of joinery are driven in with the hammer, and given a turn or two with a screwdriver to bring them flush. An ingenious inventor, for many years somewhat prominently identified with the business, has brought out a new screw, which is adapted for driving, and which enters the wood without tearing the grain. The gimlet point is dispensed with, and a cone point substituted. The thread has such a pitch that it drives in barb fashion, offering no resistance in entering, but firmly resisting all attempts to withdraw it except by turning it out with the screwdriver. The head is flat, but in setting it up two nipples or square-shouldered projections are raised in it by the one operation. The screwdriver takes hold of them more easily than it does of the customary nick, and holds quite as firmly, and when driven flush the projections on the head are not in the way, and do not disfigure it. It is claimed that this screw can be made one-third cheaper than ordinary screws, the principal saving being effected in doing away with the necessity of sawing the nick in the head.

**Pearls in New Zealand.**—While passing along the banks of Oakley Creek, an old resident of the district observed a peculiar and, to him, new shell-fish in the sand. A little search disclosed a large number of them of various sizes. The inner coating of the shell was found to be mother-of-pearl of fine quality, and in several of the larger shells he found loose pearls. The pearls are described as unusual in form and colour, not perfectly round, but far more brilliant than ordinary pearls.

**Pneumatic and Telegraphic Messages.**—Mr. Fawcett stated before the House of Commons that the number of pneumatic messages sent in Paris in the course of a month was 40,000, or 480,000 a year. He had further to state that there seemed to be the greatest variety of opinion as to the relative advantages, both financial and otherwise, in the conveying of messages in large cities by means of pneumatic tubes and telegraph wires. He would take steps during the recess to cause an impartial inquiry to be made into the whole subject, with the assistance of one or two competent officials from the Post Office. We understand that the circular system of pneumatic telegraphs, hitherto used in Paris, is gradually being superseded by that known as the radial one.

**Detection of Salicylic Acid.**—The following method of detecting small quantities of salicylic acid in wines and such-like coloured fluids has been suggested by Dr. Weigert, and is equally applicable to the detection of acid in beer. Fifty cub. cent. (about 1¾ oz.) of the wine or beer is shaken up for some minutes in a flask with 5 cub. cent. of amylic alcohol, which dissolves all the salicylic acid; the supernatant liquid can be poured off into a test-glass, and it is then mixed with an equal volume of alcohol, in which it dissolves; to this solution are added a few drops of dilute solution of ferric chloride; if any salicylic acid be present the usual well-known deep violet colour will at once be produced. It is said that a very small quantity of salicylic acid can be detected in this way.

# The Scientific Review

AND

# SCIENTIFIC AND LITERARY REVIEW,

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ESTABLISHED 1ST MAY, 1862.

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*President,* SIR ANTONIO BRADY.

THE SESSION 1879—1880
IS ENDED.

The Balance Sheet 1879-80 can now be inspected.

Subscriptions are payable to Mr. G. A. STRETTON, the Receiver, 4, St. Martin's-place, S.W., who is the proper official to give receipts.

F. W. CAMPIN, Sec.

## Proceedings of the Institute.

The Institute being out of Session, there is no business to report.

## Monthly Notices.

*Diffusion of the Electric Light.*—M. L. Cémandot suggests the use of spun glass as an effective method of procuring the diffusion of the electric light. He uses a lamp with double glass walls, between which is placed the spun glass.

*Memoir on Galvanism.*—The Aldini Gold Medal (worth £40) will be awarded by the Academy of Sciences of the Institute of Bologna to the best memoir on galvanism (animal electricity). Memoirs to be written in Italian, Latin, or French, and sent in before June 30, 1882.

*A Novelty in Fire Alarms* and warning thermometers has been produced by our esteemed friend, Mr. G. E. Pritchett, F.S.A., architect, of Spring-gardens, S.W. It is a very ingenious instrument, whereby the action of air and mercury is utilised in a closed tube or holder of peculiar form, securing unerring action upon an electric bell or alarm sounder. We hope shortly to present our readers with full details as to this very scientific, ingenious, and important invention.

*Composite Diamonds.*—A *soi-disant* diamond expert of Chicago asserts that many of the so-called solitaires, sold as single stones, are made up of small stones cleverly put together. Under the blowpipe they separate. He adds that not one diamond in ten sold in the United States is other than the refuse of the London market. Nearly all are off-coloured, specked, or feathered, and are sold at a fictitious value. We give Americans credit for being too "cute" to allow such transparent frauds to be practised on them.

*A Magneto-Electric Stone-Breaker.*—This machine is one of the latest American inventions. A dynamo-electric machine furnishes the power to an electro-magnetic chopper capable of delivering from 1,000 to 2,000 blows per minute. Stone-breaking requires the exertion of very great forces through very small distances, in fact, precisely the kind of work for which electro-magnetic machines on a large scale might be expected to be successful. The cost of generating the electricity is, however, a drawback.

*Another Electric Motor.*—M. Marcel Deprez, the ingenious inventor of many pieces of electrical apparatus, has just brought out an electric motor, in which a piston of soft iron is attracted up and down in a hollow cylindrical electro-magnetic coil with a motion like that of an ordinary steam engine piston. This principle is not new, having been employed by Page, Bourbouse, and and Du Moncel in the construction of electro-motors. The novel point, however, about the motor of M. Deprez is that the magnetism of the soft iron core is neither ever reversed or interrupted. This was the weak point of the earlier machines, but it has been obviated in the new form by the device of dividing the solenoidal coil into sections like the separate coils of the ring-armature of the Gramme machine, the current being thus transmitted first to one part of the cylindrical coil and then to another. The commutator which distributes the current successively to the various sections is worked by an eccentric on the shaft of the fly-wheel in the ordinary way.

*Phosphorescence of the Glowworm.*—In some experimental researches, the results of which have lately been published in the *Comptes Rendus* of the French Academy, M. Jousset de Bellesme draws the following conclusions:—It is very probable that the phosphorescent substance is a gaseous product, for the structure of the gland, well studied by Owsjanikof, does not give one the idea of an organ secreting liquid. But chemical phosphorescent products at an ordinary temperature are not numerous, which induces one to believe the substance is phosphuretted hydrogen. It is for chemists to elucidate this point; but they should seek the matter in the cellular protoplasm and not directly. My researches induce me to believe phosphorescence a property of protoplasm, consisting in the disengagement of phosphuretted hydrogen. This explains why many of the lower animals, deprived of a nervous system, are phosphorescent. Besides, it offers the advantage of connecting the phenomena of phosphorescence in living beings with that we see in organic matters in a state of decomposition. It is one more example of a phenomenon of the biological order traced to an exclusively chemical cause.

*Denis Papin*, born in 1647, a reputed inventor of the first steam vessel, and whose name is associated with Papin's Digester, has been honoured by a statue in his native town, Blois, which was unveiled on Sunday, the 29th of August.

*Messrs. Cassell, Petter, and Galpin* announce for the coming season new instalments of their popular serials. The fourth volume of the "New Natural History," edited by Professor Martin Duncan, which contains 'Birds,' by Mr. R. Bowdler Sharpe, F.L.S., 'Reptiles' and 'Amphibians,' by Prof. Martin Duncan; the yearly volume of "Science for All" for 1880, edited by Dr. Robert Brown; Vols. IV. and V. of "The Countries of the World," by Dr. R. Brown; "Great Industries of Great Britain," complete in three volumes; Vol. II. of "Our Own Country;" and "Insect Variety: its Propagation and Distribution," by Mr. A. H. Swinton, member of the Entomological Society.

*A Natural Gas Well near Boston.*—A notable discovery is reported from Ocean Spray, a new summer resort near Boston, Mass., U.S. While a driven well was being sunk, July 22, a vein of natural gas, which burns with a clear brilliant light, was struck at the depth of 122 feet. Being so near the house of Deacon Augustus Reed as to endanger its safety, the blaze was smothered and the well abandoned. The adjoining lot was owned by Mr. J. H. Jessop, who, thinking the gas worth boring for, had another well driven. Gas was struck July 30, and since then the flow has been abundant and strong. Mr. B. R. Sturges, of South Boston, writes us that the pressure of the gas was measured August 5 by the State Gas Inspector, and found to be that of 31¾ inches of water. Photometric tests made by the Superintendent of the East Boston Gas Works showed the gas to be of 14 candle power, giving a pure and brilliant light with various styles of burners. An attempt will be made to utilise the gas for illumination, cooking, and heating.—*Scientific American.*

*Mr. Baden Powell's paper*, before the Economic Science Section of the British Association, "On the Results of Protection in the United States," was most warmly received. It asserted the existence of four principal obstacles to the adoption of a more liberal policy: (1) the present cheapness of land; (2) the influx of foreign capital into the States; (3) government by manhood suffrage; and (4) vested interests, the last appearing to him very difficult to overcome, except with the increase of population. The lively discussion which followed included the expression of Sir ANTONIO BRADY'S surprise that the astute Yankee should consent to pay a tax of 30 to 50 per cent. upon many articles simply to benefit 5,000 manufacturers; Capt. Bedford Pim's explanation that to him protection meant empire, and free trade Utopia; and Mr. STEPHEN BOURNE'S answer that it was the agitators in this country for a return to protection who retarded the adoption of free trade by other countries. Mr. Hastings, in summing up, said those who want a protective duty on our imports to increase our prosperity were like a man who with a falling income went to his butcher and baker and asked them to charge him more for meat and bread. In his address as president of this section, Mr. Hastings, M.P., contended bravely for statistics, notwithstanding evil use, as being the true foundation of legislation; while no legislation by which the productiveness of the land, the foundation of national wealth, was promoted could be opposed to political economy. Even the Compensation for Disturbance Bill was founded on a principle that had been law ever since the days of the Roman emperors in other countries of Europe.—*Atheuæum.*

*Researches on Ozone.*—At very elevated temperatures the transformation of oxygen into ozone and of ozone into oxygen probably obey the laws of the decomposition of homogeneous systems. At mean temperatures the decomposition of ozone is considered always complete, slowly at common temperatures, but quickly at 250°. The instability of this body is therefore comparable to that of hypochlorous acid or nitrogen chloride. But whilst the heat necessary to constitute these explosive bodies can only be acquired by a secondary simultaneous reaction, the allotropic transformation of oxygen may be determined by the electric effluve alone. The act of electrisation places momentarily oxygen in conditions analogous to those of bodies which possess the property of combining directly, or of becoming polymerised under the action of heat.

## BRITISH ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

THE jubilee of the British Association for the Advancement of Science was opened on the 21st ult. in the flourishing seaport of Swansea; and the President for the year, Professor Ramsay, Director-General of the Geological Survey of the United Kingdom, delivered the opening address. That address will be read with intense interest, not only by men of science but also by the general public, who have of late, thanks to the British Association and similar scientific bodies, taken a lively interest in subjects, the study of which had hitherto been confined to the few. The British Association has now completed the fiftieth year of its existence, and what might be called its golden wedding has been celebrated in its visit to South Wales. Half a century ago the first meeting of the Association was held in the city of York, where the opening meeting of the second half century of its existence will be appropriately held next year. For a long time after its birth the Association was looked upon in many lights. Its objects were applauded by men of learning, whilst it was sneered at by many, and ridiculed by the multitude generally. To-day it is a power in the world of thought, and is enjoying a stoutly fought-for and undying reputation. The most important cities and towns in the kingdom compete yearly for its presence. To many who have not studied it, the study of science may appear dry and disagreeable; but those who have mastered it in any or many of its branches know the wealth of enjoyment it affords. Even, however, from an outsider's view, there are many enjoyments in connection with the visits of the British Association to various parts of the country. These visits take place during the most delightful season of the year, and those that fix upon the towns to be visited almost invariably cast their lots in pleasant places. As well as the papers to be read in the various sections, there are excursions, which not unfrequently partake of the character of a pic-nic, to the most interesting spots in the neighbourhood. The houses of the county magnates are thrown open to the approach of the members of the Association, so that altogether their labours are by no means unmixed with pleasure. This year the bold and beautiful scenery of South Wales had to be inspected; and it is to be hoped that its inspection brought with it improvement in health as well as addition to scientific knowledge.

The meeting was opened in the Music Hall, Cradock-street, Swansea, by the formal resignation of his presidentship of Dr. Allman and the inauguration of his successor, Professor Ramsay. Among the other gentlemen on the platform were Mr. Pengelley, Mr. J. Heywood, Mr. J. Glaisher, Professor J. H. Gladstone, Captain Douglas Galton, Dr. Sorby (President of the Geographical Society), Professor Abel, Dr. Sclater, Dr. Gilbert, Admiral Sir E. Ommanney, Mr. J. G. Jeffreys, the Abbé Renard, Mr. Balfour, Professor Williamson, Mr. Hussey Vivian, M.P., Mr. Dillwyn, M.P., the Mayor of Swansea, Professor Adams, Dr. Günther, General Sir John Henry Lefroy, and Mr. G. W. Hastings, M.P.

Mr. J. Jenkins, the Mayor of Swansea, in welcoming the British Association, said that since its former visit, thirty-two years ago, every year had added to its progress, its usefulness, and the marvellous impulse it had given to every branch of science. Thirty-two years ago Swansea was a marine resort of great natural beauty; now it was a centre of manufacturing life, in which science was applied with a grim reality. Ingenious Bible critics contended that this was the ancient Tarshish, the tin-producing country of those times. Whatever it was then, it certainly was now the tin manufactory of the whole world, and it could not be the fault of the men of South Wales if the wise men of the East, their brethren of the setting sun, and mankind in general, did not continue to obtain from this part of the United Kingdom their supplies of tin. They did not pretend to introduce to this learned society anything new in science, but they rather hoped to obtain hints and information which would be of advantage in the future to the manufacturers of the district.

Dr. Allman then took the chair, and after an eulogium upon the geographical researches and knowledge of his successor, transferred the presidentship to Dr. Andrew C. Ramsay, F.R.S., Director-General of the Geographical Society of the United Kingdom.

Prof. Ramsay's address was "On the Recurrence of Certain Phenomena in Geological Time." He said in this address I propose to consider the recurrence of the same kind of incidents throughout all geological time, as exhibited in the various formations and groups of formations that now form the known parts of the external crust of the earth. In older times, Hutton and Playfair, in a broad and general manner, clearly pointed out the way to the doctrine of uniformity of action and results, throughout all known geological epochs down to the present day; but after a time they obtained but slight attention, and were almost forgotten, and the wilder cosmical theories of Werner more generally ruled the opinions of the geologists of the time. Later still, Lyell followed in the steps of Playfair, with all the advantages that the discoveries of William Smith afforded, and aided by the labours of that band of distinguished geologists, Sedgwick, Buckland, Mantell, De la Beche, Murchison, and others, all of whom some of us knew. Notwithstanding this new light, even now there still lingers the relics of the belief that the physical phenomena which produced the older strata were not only different in kind, but also in degree from those which now rule the external world. Oceans, the waters of which attained a high temperature, attended the formation of the *primitive* crystalline rocks. Volcanic eruptions, with which those of modern times are comparatively insignificant, the sudden upheaval of great mountain chains, the far more rapid decomposition and degradation of rocks, and, as a consequence, the more rapid deposition of strata formed from their waste—all these were assumed as certainties, and still linger in some parts of the world among living geologists of deservedly high reputation. The chief object of this address is, therefore, to attempt to show, that whatever may have been the state of the world long before geological history began, as now written in the rocks, all known formations are comparatively so recent in geological time, that there is no reason to believe that they were produced under physical circumstances differing either in kind or degree from those with which we are now more or less familiar. It is unnecessary for my present purpose to enter into details connected with the recurrence of marine formations, since all geologists know that the greater part of the stratified rocks were deposited in the sea, as proved by the molluscs and other fossils which they contain, and the order of their deposition and the occasional stratigraphical breaks in succession are also familiar subjects. What I have partly to deal with now, are exceptions to true marine stratified formations, and after some other important questions have been considered, I shall proceed to discuss the origin of various non-marine deposits from nearly the earliest known time down to what by comparison may almost be termed the present day. The instances of the metamorphism of stratified rocks in the British Isles, throughout Europe, and on the American continent, the President went on to state, proved that from the Laurentian epoch onward the phenomenon of extreme metamorphism of strata has been of frequent recurrence all through Palæozoic and Mesozoic times, and extends even to a part of the Eocene series equivalent to the soft unaltered strata of the formations of the London and Paris basins, which, excepting for their fossil contents and sometimes highly inclined positions, look as if they had only been recently deposited. The oldest volcanic products of which he had personal knowledge were of Lower Silurian age. He knew of no true volcanic rocks in the Upper Silurian series. In the old Red Sandstone of Scotland lavas and volcanic ashes are of frequent occurrence, interstratified with the ordinary lacustrine sedimentary strata. Volcanic rocks are also intercalated among the Devonian strata of Devonshire. He knew of none in America or on the Continent of Europe. In Scotland volcanic products are common throughout nearly the whole of the Carboniferous subformations, and they are found also associated with Permian strata. In the Mesozoic or Secondary epochs, of Jurassic age (Lias and Oolites), it was stated by Lyell, with some doubt, that true volcanic products occur in the Morea and also in the Apennines, and it seemed probable that the Rajmahal traps may also be of Jurassic age. Darwin stated that the Cordillera, of South America, had been, probably with some quiescent periods, a source of volcanic matter from an epoch anterior to our Cretaceo-oolitic formation of the present day. In the Deccan volcanic traps rest on Cretaceous beds, and are overlaid by Nummulitic strata, and according to Medlicott and Blanford there were poured out in the interval between Middle Cretaceous and Lower Eocene times. In Europe the only instance of a volcano of Eocene age was that of Monte Bolca, near Verona, where the volcanic products are associated with the fissile limestone of that area. The well-preserved relics of Miocene volcanoes are prevalent over many parts of Europe, such as Auvergne and the Velay, where the volcanic action began in Lower Miocene times, and was continued into the Pliocene epoch. The volcanoes of the Eifel are also of the same general age, together with the ancient Miocene volcanoes of Hungary. The volcanic rocks of the Azores, Canaries, and Madeira are of Miocene age, while in Tuscany there are extinct volcanoes that began in late Miocene, and lasted into times contemporaneous with the English Coralline Crag. In the north of Spain also, at Olot, in Catalonia, there are perfect craters and cones remaining of volcanoes that began to act in newer Pliocene times, and continued in action to a later geological date. To these he must add the great *coulées* of Miocene lava so well known in the Inner Hebrides, on the mainland near Oban, &c., in Antrim in the North of Ireland, in the Faroe Islands, Greenland, and the Franz-Joseph Land. In nearly all geological ages volcanoes have played an important part, now in one region, now in another, from very early Palæozoic times down to the present day; and, as far as his knowledge extended, at no period of geological history was there any sign of their having played a more important part than they do in the epoch in which we live. The mountain chains of the world are of different geological ages, some of them of great antiquity and some of them comparatively modern. In North America the Laurentian rocks formed a high mountain-chain of pre-Silurian date, which has since constantly been worn away and degraded in sub-aërial denudation. In Shropshire and in parts of North Wales, and in Cumberland and Westmoreland, the Lower Silurian rocks by upheaval formed hilly land before the beginning of the Upper Silurian epoch, and both here and in Scotland the rocks have since undergone considerable movements, which in the main seem to have been movements of elevation, accompanied undoubtedly by that constant atmospheric degradation to which all high land is especially subject. In North America the great chain of the Alleghany Mountains underwent several disturbances, the last (a great one) having taken place after the deposition of the Carboniferous rocks, and before that of the new Red Sandstone. In South America the main great disturbance of the strata that form the chain of the Andes took place apparently in post-Cretaceous times. The Alps, the rudiments of which began in more ancient times, received their greatest disturbance and upheaval in post-Eocene days, and were again raised at least 5,000 feet at the close of the Miocene epoch. In the north of India the history of the Great Himalayan range closely coincided with that of the Alps. It would probably not be difficult by help of extra research to add other cases to this notice of recurrence of the upheaval and origin of special mountain chains; but enough had been given to show the bearing of this question on the argument of repetition of the same kind of events throughout all known geological time. The next point was the recurrence of the development of beds of various salts (chiefly common rock salt) in many formations. The earliest deposits of rock-salt that he knew about are in the Punjaub. The beds of salt are of great thickness, and along with gypsum and dolomitic layers occur in marl of a red colour like our Keuper marl. The Salina or Onondaga Salt Group of North America, which forms part of the Upper Silurian rocks, and lies immediately above the Niagara Limestone, is rich in gypsum and in salt brine, often of a very concentrated character, "which can only be derived from original depositions of salt," and it is supposed to contain solid rock-salt 115 feet in thickness at the depth of 2,085 feet, near Saginaw Bay in Michigan. In Michigan salts are found from the Carboniferous down to the Devonian series; and in other parts of the United States, from the lower coal-measures salts are derived which must have been deposited in inland areas, since even in the depths of inland seas that communicate with the great ocean, such as the Mediterranean and the Red Sea, no great beds of salt can be deposited. Before such strata of salt can be formed supersaturation must have taken place. In the North of England, at and near Middlesbrough, two deep bore holes were made some years ago in the hope of reaching the coal-measures of the Durham coal-field. One of them, at Saltheme, was sunk to a depth of 1,355 feet. First they passed through 74 feet of superficial clay and gravel, next through about 1,175 feet of red sandstones and marls, with beds of rock-salt and gypsum. The whole of these strata (excepting the clay and gravel) evidently belong to the Keuper marls and sandstones of the upper part of our New Red series. Beneath these they passed through 67 feet of dolomitic limestone, which in this neighbourhood forms the upper part of the Permian series, and beneath the limestone the strata consist of 27 feet of gypsum and rock salt and marls, one of the beds of rock salt having a thickness of 14 feet. This bed of Permian salt is of some importance, since he had been convinced for long that the British Permian strata were deposited, not in the sea, but in salt lakes comparable in some respects to the Great Salt Lake of Utah, and in its restricted fauna to the far greater salt lake of the Caspian Sea. The gypsum, the dolomite or magnesian limestone, the red marls covered with rain pittings, the sun cracks, and the impressions of footprints of reptiles made in the soft sandy marls when the water was temporarily lowered by the solar evaporation of successive summers, all point to the fact that our Permian strata were not deposited in the sea, but in a salt lake or lakes once for a time connected with the sea. In the Permian strata of Russia he believed that the red marls, grits, sandstones, conglomerates, and great masses of gypsum and rock-salt were all formed in a flat inland area which was occasionally liable to be invaded by the sea during intermittent intervals of minor depression, sometimes in one area, sometimes in another, and the fauna small in size and poor in numbers is one of the results, while the deposition of beds of salt and gypsum is another. If so, then in the area now called Russia, in sheets of inland Permian water, deposits were formed strictly analogous to those of Central Europe and of Britain, but on a larger scale. In the Triassic series salt is found in the Bunter sandstones of Schoningen in Brunswick, and also near Hanover. In the lower part of the Keuper series deposits of rock-salt are common in England and Ireland. In the Jurassic series (Lias and Oolites) salt and gypsum are not uncommon. In the Cretaceous rocks salt occurs at Jebel Usdom by the Dead Sea, and other authorities state that it occurs in the Pyrenees and at Biskra in Africa, where "mountains of salt" are mentioned as of Cretaceous age. In the Eocene or Older Tertiary formations rock-salt is found at Cardona in Spain, and at Kohat in the Punjab it occurs at the base of Nummulitic beds. The record does not end here, for a zone of rock-salt lies in Sicily in Lower Miocene beds, and in Miocene strata gypsum is found at several places in Spain. In Pliocene or Later Tertiary formations thick beds of gypsum are known in Zante, and strata of salt occur in Roumania and Galicia, while in Pliocene rocks, or in post-Tertiary beds, a thick bed of pure salt was penetrated to a depth of 38 feet at Petit Anse in Louisiana. Rock salt, and other salts, are thus of frequent recurrence throughout all geological time, and as it is impossible that common salt can be deposited in the open ocean, it follows that this and other salts must have been precipitated from solutions, which, by the effect of solar evaporation, became at length supersaturated, like those of the Dead Sea, and the great salt lake of Utah. He now came to the subject of recurrences of fresh water conditions both in lakes and estuaries. In the introduction to the "Geology of India," by Messrs. Medlicott and Blanford, mention is made of the Blaini and Krol rocks as probably occupying "hollows formed by denudation in the old Gneissic rocks," and the inference is drawn that, "if this be a correct view, it is probable that the cis-Himalayan Palæozoic rocks are in great part of fresh-water origin, and that the present crystalline axis of the Western Himalayas approximately coincides with the shore of the ancient palæozoic continent, of which the Indian Peninsula formed a portion." The Krol rocks are classed broadly with "Permian and carboniferous" deposits, but the Blaini beds were undoubtedly considered to belong to Upper Silurian strata. If this point should be established this is the earliest known occurrence of fresh-water strata in any of the more ancient palæozoic formations. The colour of the strata formed in old lakes, whether fresh or salt, of palæozoic and mesozoic age is apt to be red, a circumstance due to the fact that each little grain of sand or mud is usually coated with a very thin pellicle of peroxide of iron. Whether or not the red and purple Cambrian rocks may not be partly of fresh-water origin is a question that no one but himself had raised. There is, however, no doubt with regard to the fresh-water origin of the Old Red Sandstone as distinct from the contemporaneous marine deposits of the Devonian strata, the absence of marine shells and the nature of the fossil fishes in these strata showing that they were deposited not in the sea, as had always been asserted, but in a great fresh-water lake or in a series of lakes. The Devonian rocks of Russia are exclusively of a marine character. The lowest members of the series consist of flag-like compact limestones accumulated in a tranquil sea and containing fucoids and encrinites, together with shells of Devonian age, while the upper division graduates into the Carboniferous series as it often does in Britain, and, like the Old Red Sandstone of Scotland, contains only fish remains, and in both countries they are of the same species. Fresh-water formations are also found deposited in estuaries and lakes from the close of the Old Red Sandstone times down to late Tertiary epochs. In fact, it may be safely inferred that something far more than the rudiments of our present continents existed long before Miocene times, and this accounts for the large areas on those continents which are frequently occupied by Miocene fresh water strata. The last special subject for discussion was the Recurrence of Glacial Epochs, a subject which was generally looked upon as an absurd crotchet when, in 1855, he first described to the Geological Society boulder-beds containing ice-scratched stones, and erratic blocks in the Permian strata of England. In July he received information from Prof. Geikie that he had discovered mammilated *moutonnée* surfaces of Laurentian rocks, passing underneath the Cambrian Sandstones of the north-west of Scotland at intervals, all the way from Cape Wrath to Loch Torridon, for a distance of about 90 miles. The next sign of ice in Britain is found in the Lower Silurian rocks of Wigtonshire and Ayrshire. In the Himalayas of Pangi, S.E. of Kashmir "old slates, supposed to be Silurian, contain boulders in great numbers," which Medlicott and Blanford believe to be of glacial origin. He knew of no boulder formations in the Carboniferous series, but they are well known as occurring on a large scale in the Permian brecciated conglomerates, where they consist "of pebbles and large blocks of stone, generally angular, imbedded in a marly paste. . . . The fragments have mostly travelled from a distance, apparently from the borders of Wales, and some of them are three feet in diameter." He knew of no certain evidence of glacial phenomena in Eocene strata, nor of any Miocene glacier deposits excepting those in the north of Italy, near Turin. These contain many large erratic boulders derived from the distant Alps, which were then at least as lofty or even higher than they are now. At a still later date there took place in the north of Europe and America what is usually misnamed "the Glacial Epoch," when a vast glacial mass covered all Scandinavia, and distributed its boulders across the north of Germany, as far south as the country around Leipzig, when Ireland also was shrouded in glacier ice, and when a great glacier covered the larger part of Britain, and stretched southward, perhaps nearly as far as the Thames on the one side, and certainly covered the whole of Anglesey, and probably the whole, or nearly the whole, of South Wales. This was after the advent of man. Lastly, there is still a minor Glacial Epoch in progress on the large and almost unknown Antarctic continent, from the high land of which, in latitudes which partly lie as far north as 60 deg. and 62 deg., a vast sheet of glacier-ice of great thickness extends far out to sea and sends fleets of icebergs to the north, there to melt in warmer latitudes. If in accordance with the theory of Mr. Croll, founded on astronomical data, a similar climate were transferred to the northern hemisphere, the whole of Scandinavia and the Baltic would apparently be covered with glacier-ice, and the same would probably be the case with the Faroe Islands and great part of Siberia, while even the mountain tracts of Britain might again maintain their minor system of glaciers. In opening this address, he began with the subject of the oldest Metamorphic rocks that he had seen—the Laurentian strata. It was evident to every person who thinks on the subject that their deposition took place far from the beginning of recognised geological time. For there must have been older rocks by the degradation of which they were formed. And if, as some American geologists affirm, there are on that continent Metamorphic rocks of more ancient dates than the Laurentian strata, there must have been rocks more ancient still to afford materials for the deposition of these pre-Laurentian strata. Starting with the Laurentian rocks, he had shown that the phenomena of metamorphism of strata had been continued from that date all through the later formations, or groups of formations, down to and including part of the Eocene strata in some parts of the world. In like manner he had shown that ordinary volcanic rocks have been ejected in Silurian, Devonian, Carboniferous, Jurassic, Cretaceo-oolitic, Cretaceous, Eocene, Miocene, and Pliocene times, and he had no reason to believe that volcanic forces played a more important part in any period of geological time than they do in this our modern epoch. So also mountain chains existed before the deposition of the Silurian rocks, others of later date before the Old Red Sandstone strata were formed, and the chain of the Ural before the deposition of the Permian beds. The last great upheaval of the Alleghany Mountains took place between the close of the formation of the Carboniferous strata of that region and the deposition of the New Red Sandstone. The deposition of salts from aqueous solutions in inland lakes and lagoons appears to have taken place through all time, and it is going on now. In like manner fresh water and estuarine conditions are found now in one region, now in another, throughout all the formations or groups of formations possibly from Silurian times onward; and glacial phenomena, so far from being confined to what was and is generally still termed the Glacial Epoch, are now boldly declared by independent witnesses of known high reputation to begin with the Cambrian Epoch, and to have occurred somewhere, at intervals, in various formations, from almost the earliest Palæozoic times down to our last post-Pliocene "Glacial Epoch." If the nebular hypothesis of astronomers be true, and he knew no reason why it should be doubted, the earth was at one time in a purely gaseous state, and afterwards in a fluid condition, attended by intense heat. By and by consolidation, due to partial cooling, took place on the surface, and as radiation of heat went on the outer shell thickened. Radiation still going on the interior fluid matter decreased in bulk, and, by force of gravitation, the outer shell being drawn towards the interior, gave way, and in parts got crinkled up, and this, according to cosmogonists, was the origin of the earliest mountain chains. He made no objection to the hypothesis, which, to say the least, seems to be the best that can be offered, and looks highly probable. But, assuming that it is true, these hypothetical events took place so long before authentic geological history began, as written in the rocks, that the earliest of the physical events to which he had drawn attention in this address was, to all human apprehension of time, so enormously removed from these early assumed cosmical phenomena that they appeared to have been of comparatively quite modern occurrence, and to indicate that from the Laurentian Epoch down to the present day all the physical events in the history of the earth have varied neither in kind nor in intensity from those of which we now have experience.

A vote of thanks was most cordially given to the learned President at the close of his address.

The Secretary, Captain Douglas Galton, in winding up the meeting, stated that the tickets taken up to that moment numbered

123 old life members, four new life members, 153 old annual members, 36 new annual members, 332 associates, 135 ladies, and seven foreign associates; together, 790.

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The most important discussion in the sections which met on Thursday was that on the report of the committee appointed at Sheffield last year for the purpose of reporting whether it is desirable that her Majesty's inspectors of elementary schools should be appointed with reference to their ability for examining the scientific specific subjects of the code, in addition to other matters.

In the Geographical Section, the President read a correspondence embodying the latest news of the Royal Geographical Society's East African Expedition under Mr. Thomson, who was expected at home in November. The President paid an eloquent tribute to the courage of the young explorer, and bore testimony to the high character of the native tribes, whose fidelity when tried had been unshaken. By a report on the present state of the spectrum analysis, Mr. Francis Galton suggested improvements on the present method of determining the heights and distances of clouds, and expressed the hope that some real advantage would be derived from the system of ballooning now carried on at Woolwich.

A soirée was given by the Mayor of Swansea in the evening.

On Saturday the only sections which sat were the Mathematical and the Mechanical. The other sections made no pretence of holding a sitting, and kept strict holiday.

There were numerous excursions, adapted to all tastes, but that which was expected to yield the greatest results, if not the most pleasure, was to the peninsula of Gower, which is so rich in geological and entomological varieties. It was arranged that a mound, supposed to be a tumulus, should be opened under the personal supervision of Mr. Hussey Vivian, M.P., and it was hoped that this mound would turn out to be not less interesting than the so-called "graves" opened some years since by Sir John Lubbock. The supposed tumulus, however, was a blank draw. It was not a place of sepulture, but simply a gravel and boulder heap, thought to have been accumulated by the centripetal action of two small streams which meet here.

Mr. Seebohn delivered a lecture in the Music Hall on "The North-East Passage," but, though professedly given for the working classes, there were very few working men present.

On Monday the Economic Section opened under the presidency of Sir Antonio Brady, in the temporary absence of Mr. George Woodyatt Hastings, M.P., who, however, was able to be present later in the day, when he delivered an address on the value of statistics. A cordial vote of thanks to the president was passed, after which a discussion took place on a paper read by Sir Antonio Brady, in the absence of the writer, Mr. G. Baden Powell, the subject matter being the lessons taught by protection in the United States. In the discussion which followed the whole question of free trade and protection was opened up, but, with the exception of a vote of thanks being passed to Mr. Baden Powell, no formal motion was made. Mr. F. N. Newcombe then read a paper on diminishing annuities.

In the Mathematical Section, Mr. J. Shoolbred brought up the report of the Committee on Tidal Observations in the English Channel; Mr. Bottomley the report of the Committee for Making Experiments on the Elasticity of Wires; and Mr. Gill the report of the Committee on Pendulums. The Hon. F. A. Russell read a paper on the "Absorption of Radiant Heat by Films of Water." Mr. Courtenay Fox, in his paper "On Some Laws which Regulate the Succession of Temperature and Rainfall in the Climate of London," arrived at the following conclusions: 1. A cold spring is very prone to be followed by a hot summer; a cold summer tends to be followed by a cold autumn; and a cold autumn has a slight tendency to be succeeded by a winter of low temperature. 2. Warm summers are generally followed by warm autumns. 3. In no fewer than eight out of the twelve months (that is, in every one except February, March, May, and October) very low temperature tends to be prolonged into the succeeding month. 4. If June, July, August, or December be warm, the next month will probably be a warm one also. 5. Two months, June and July, tend, when very dry, to be followed by dry ones. On the other hand, a dry August indicates the probability of a wet September. 6. A wet December is apt to be succeeded by a wet January.

In the Geographical Section, presided over by General Thullier, Lieutenant R. Ivens, a member of the Portuguese expedition party to West Central Africa, gave the results of the expedition, which was carried out at the expense of the Portuguese Government; and Mr. Laurence Oliphant read an interesting paper describing his travels east of the Jordan, where he went for the purpose of surveying a road for a proposed line of railway to the valley of that river.

Professor J. Prestwich read a paper on the geological evidence of the submergence of the south-west of Europe during the early human period. He thought that there was clearly such submergence, which swept away the older mammalia and Palæolithic man. Whether Neolithic man descended from some Palæolithic tribe which escaped to the highlands, or whether he subsequently emigrated from the East, he could not say, but Neolithic man evidently appeared after an alluvial period. A long discussion took place on the theory here suggested, but the opinion of the section was against any sudden wide sweeping submergence.

In the Anthropological Division, Dr. Phrene read a paper, in which he described the retention of certain ancient pre-historic customs in the Pyrenees, and amongst them the practice of serpent worship.

Mr. Ernest Benedict, in the Mechanical section, read a paper showing the feasibility of constructing a Channel Tunnel, and the president (Mr. Abernethy) expressed himself favourably towards the boring experiments now being carried on at Dover.

On Tuesday the papers were, as a rule, got through as quickly as possible, discussion, even when it did take place, not being conducted with much energy, and nearly all the work for the day was concluded before one o'clock. An excursion to the waterworks was largely attended, and the members were entertained to luncheon by the corporation.

Lieut. Temple, R.N., read a paper before the Geographical section on Nordenskjold's recent voyage in the Vega.

Lieut. Col. Tanner read a paper descriptive of some of the tribes in Northern Afghanistan. He considered that the Indian Government should make a recruiting ground of this country, where there were hundreds of fine fellows who would be only too glad to join our army if sufficient inducements were held out to them. On moving a vote of thanks, the President (Lieutenant-General Lefroy) referred to the great advantages which would hereafter be derived from the topographical labours of the officers now with each column of the British force in Afghanistan.

Dr. Phene described some of the remarkable objects which he had found in the Balearic Islands. He also read a paper giving the results of a recent examination of the topography of the Troad, and said that during several successive visits to the plains of Troy his attention had been drawn to the former course of the Scammander from remains of irregularities in the surface, indicating former defence by earthworks, and also to earthworks, indicating, as he thought, Trojan interments.

In the Zoological and Botanical department of the Biological section, Dr. Sclater exhibited the first volumes of zoological reports of the voyage of the Challenger. He also read a paper on the classification of birds.

In the Anthropological Department, Miss Buckland read a paper on evidences of surgery and superstition in Neolithic times—for example, trepanning children for the prevention of epileptic and convulsive fits. Professor Rolleston, in describing the crania of bushmen, stated that they were not of so degraded a type as had been popularly supposed. Judging the skulls of bushmen by well recognised principles, they must have possessed very considerable intelligence.—Mr. Hyde Clarke detailed the results of his further researches of the pre-historic relations of the Babylonian, Chinese, and Egyptian characters, language, and culture, and their connection with sign and gesture language.—Lieutenant Temple gave an account of some curious customs amongst the mountain Lapps of Norway.

In the Economic section, Mr. Westgarth examined the contradictory replies of economists to the question, What is capital? and concluded by saying that ever since Adam Smith's day there has been a prevalent notion that capital must at last grow so abundant that profit or interest upon it would all but cease. It would fall so low, said economic opinion, that there would be no longer sufficient motive to save any more of it. But such a view was a complete misreading of the facts of life. There was a constant economising tendency to do with the least possible capital, and on the other hand a constant demand for more and more of it with the extension of exchange operation. The combined effect was to maintain capital and insure for it everywhere a permanent and substantial remuneration.

The Mechanical Science Section sat for only a brief time, the greater part of which was taken up by Mr. W. E. Hall, who, by means of geometrical drawings and a variety of experiments with models, endeavoured to demonstrate that the Plimsoll Royal Commission could not determine the load line of a ship. Mr. Hall claimed for his method that it was a first attempt to give a proportional division of the displacement of ships.

A deputation of delegates from various scientific societies to the association met for the purpose of inducing the council of the association to assemble a day or two before the opening of the congress each year, in order to discuss scientific matters, and to visit places of antiquarian, archæological, or other interest in the district where the association is to assemble. No section met on Wednesday. Some papers which were not read on the previous day have been allowed to stand over and take their chance at the next meeting.

At a general meeting of the committee, it was resolved that the following grants of money, amounting to £1,010, should be made for scientific purposes: Mathematics and Physics—Mr. G. H. Darwin, lunar disturbance of gravity, £30; Professor Everett, underground temperature, £20; Professor Carey Foster, electrical standards, £100; Mr. James Glaisher, luminous meteors, £15; Dr. Joule, mechanical equivalent of heat, £40; Dr. O. Lodge, high insulation key, £5; Professor Sylvester, fundamental invariations, £40; Sir William Thomson, seismic experiments, £30; Sir Wm. Thomson, tidal observations, £10; Mr. J. M. Thomson, inductive capacity of crystals and paraffins, £10. Chemistry—Dr. Gladstone, specific refractions, £10; Lord Rayleigh, spectrum analysis, £10. Geology—Professor Duncan, fossil polyson, £10; Mr. J. Evans, geological record, £100; Professor E. Hull, underground waters, £10; Professor A. C. Ramsay, earthquakes in Japan, £25; Dr. Sorby, metamorphic rocks, £10; Professor W. C. Williamson, tertiary flora, £20. Biology—Dr. M. Foster, Scottish zoological station, £50; Dr. M. Foster, Naples zoological station, £75; Lieutenant-Colonel Godwin Austen, natural history of Socotra, £50; Mr. Gwyn Jeffreys, exploration of sea bed north of the Hebrides, £50; General Pitt Rivers, anthropological notes, £20; Dr. Pye Smith, elimination of nitrogen during bodily exercise, £50; Professor Rolleston, prehistoric remains in Dorsetshire, £25; Mr. Sclater, natural history of Timorlaut, £50; Mr. Stainton, zoological record, £100. Economic Science and Statistics—Mr. F. Galton, estimation of weights and heights of human beings, £30. Mechanics—Mr. Bramwell, patent laws, £5; Mr. James Glaisher, wind pressure on buildings, £5; Professor Osborne Reynolds, steering steamships, £5; making a total of £1,010.

At the concluding meeting Mr. Hussey Vivian, M.P., moved the thanks of the meeting to Professor Ramsay for his presidential address. The President, in his reply, referred to his visit to Swansea in 1848, and his personal recollections of De la Beche and Edward Forbes. Since then he had not visited the town until now, and he was greatly struck at the great strides which had been made in improvements, and towards commercial development. He said that his address had cost him great labour, not in the printing, but in the thinking out of his subject, which for years had been gathering in his mind, and he seized on the present occasion as a happy one for bringing a very large subject before the public. Some persons thought there was antagonism between the practice and theory of geology, but his impression was the reverse of that. He thought the theoretical made the best practical geologist, for they could see through stones to a much greater depth than those who regarded them in a merely superficial manner. This statement he illustrated by citing instances of theoretical geologists accurately determining the existence of coal beds and of water by mere superficial examination of a district, and so saving the trouble and expense of haphazard borings.

The next meeting, which will be opened at York on August 31 next year, is looked forward to with unusual interest. The celebration of the Association's jubilee will probably be an event in its not uneventful history. Financially speaking, the present meeting has been unsuccessful. The total receipts amount to only £899, as against £1,736 received at Sheffield. The Association tickets issued at Swansea were 389, as against 522 at Sheffield. The number of ladies' tickets was less than one-half, being 147 against 351; but whilst no tickets to foreigners appear to have been issued at Sheffield, there were twelve issued at Swansea. The total number of tickets issued was 915, made up as follows: Old life members, 144, new life members 41, associates 389, ladies 147, and foreigners 12. The total receipts amount to £899, the smallest amount since the Association meeting at Hull.

IMITATION OF OLD SILVER.—The *Révue Industrielle* gives the following process for giving to any silver plated or silver article the characteristic appearance of antique plate. The article is dipped in a bath of water containing about 10 per cent. of sulphide of ammonium and then scratch-brushed with a brush made of glass threads or "bristles." When afterwards burnished with an agate tool its surface becomes a beautiful dark brown colour.

# Proceedings of Societies.

## BRITISH ARCHÆOLOGICAL ASSOCIATION.

MAY 26.—Mr. H. Syer Cuming in the chair.—It was announced that the council had accepted the invitation of the Mayor and Corporation of Devizes to hold the Congress in that town in the autumn. Several places of antiquarian interest in the locality will be visited.—A letter was read from the Rev. F. Smith, of Woodchester, reporting the intention of opening some of the magnificent pavements of the Roman villa there if funds are available. Funds are wanted for the work of uncovering and for erecting a protecting building over them that they may be always open to view. Any amount will be gladly received if sent to the Rev. F. Smith, Woodchester, or to Mr. L. Brock, Hon. Sec. of the Association.—The discovery of a Roman villa at Castor was announced. It is about a quarter of a mile from the station, and a pavement of squared stone has already been opened.—Mrs. Cope exhibited a brass ring of fourteenth century date, found at Berkhampstead.—The Rev. S. M. Mayhew described a bronze censer of Roman date, and several other articles recently found in London.—Mr. T. Morgan exhibited a first brass coin of Trajanus Decius from Melrose, which appeared to refer to the Dacian campaign.—Mr. C. Brent exhibited a singular example of early-looking pottery from the South Seas, and Mr. L. Brock described a large number of articles from London Wall. These were mostly of Roman date, but among them was a bone instrument for steadying parchment when in the hands of the writer, of Saxon date, found in the same place. Several prehistoric implements of jadite from the Mentone caves were also shown.—Dr. Stevens sent notes on the discovery of flint implements in Reading Drift, where they have not hitherto been met with.—The first paper read, by the Rev. S. M. Mayhew, was descriptive of the remarkable Roman villa at Sandown, Isle of Wight, now being opened by Capt. Thorpe. Drawings of some of the pavements were shown, one being of great beauty. Capt. Thorpe has discovered the positions of two other buried villas at no great distance.—The second paper, by Mr. Bradley, was upon the measurements of Ptolemy applied to the southern and western shores of Britain, in reply to a similar paper read before the Association by Mr. G. Hills on a former occasion. In Mr. Hill's absence some further explanatory notes were read by Mr. W. de Gray Birch.—The third paper was by Mr. W. C. Dymond, and was descriptive of the great British camp at Worlebury, Weston-super-Mare. After giving details of the remarkable walls, the author proceeded to describe the approaches, and expressed a doubt as to the existence of the supposed platforms for slingers, a remarkable and unusual feature of the external defence, which have been pointed out, apparently erroneously, by former writers. The paper was illustrated by carefully prepared plans.

JUNE 3.—Mr. Syer Cuming in the chair.—It was announced that the Devizes Congress would commence on the 16th of Aug., the Earl Nelson having been elected President for the Congress and the following year.—The death of Mr. Planché, Vice-President, was referred to in fitting terms.—Dr. Stevens announced the discovery of Roman remains at Carton, Wilts, in a position that appears to indicate the existence of buildings at no great distance.—A seal was exhibited with an inscription, "Johanna de Breneford."—Dr. Kendrick exhibited a curious wooden spoon, with the crowned heart of the Douglas family; Mrs. M. Hyde a silver goblet, with portraits in relief.—Dr. Woodhouse described the progress of the demolition of old Fulham Church, and produced several early flooring tiles. The monumental slab of Bishop Hinchman has also been found.—Mr. W. Money exhibited photographs of the carved bosses of the roof of St. Nicholas' Church, Newbury, which are boldly carved with the emblems of our Lord's passion.—The Rev. S. M. Mayhew described several beautiful objects of antiquity, and also a portrait of the Duke of Cumberland painted on glass.—Mr. C. Brent exhibited a curious MS., relating to accounts paid by Cecil, Lord Burleigh, 1593.—The first paper was by Mr. C. W. Dymond, on "Cup Markings on Burley Moor," and was read by Mr. W. de Gray Birch. It was descriptive of a series of these curious markings on a stone of large size which had hitherto escaped observation.—The second paper was on the site of the village of Wrangholm, near Old Melrose, the birthplace of St. Cuthbert, by Mr. E. Frier, and was read by Mr. L. Brock. The third paper was by Mr. T. Morgan, on Roman inscriptions from Italy, and now built up in the walls of a mansion at Higham, Kent. They are all sepulchral in character, and are mostly surrounded with architectural borders of great beauty. They were brought to England in the last century, when the collection of classical antiquities was so prevalent. The paper is the second of a series on similar collections in England, and it is to be hoped that others may follow, that a permanent record may be kept of these contributions to history, which are at present difficult of access or comparison.—Mr. G. Wright reported the arrangements for the Congress, and named the places to be visited.

## ROYAL SOCIETY OF LITERATURE.

MAY 26.—Sir P. de Colquhoun in the chair.—Dr. Abel read a paper on "The Diversity of National Thought as reflected by Language," in which he endeavoured to show that with the exception of terms denoting material objects or expressing most ordinary sensations, the words of all languages are really different in meaning from their reputed representatives in other tongues. As nations differ in their notions, the signs expressive of these notions, *i.e.*, the words, could not but differ in the senses they conveyed. By a comparison between French, German, and English, Dr. Abel showed that there was a considerable diversity between words seemingly identical in meaning. Such words often only corresponded partially with each other, the one having either some additional meaning not found in the other, or the various ingredients of their meanings being combined in different proportions, even when otherwise identical. Then, again, there were terms found in some languages but not occurring in others, in which cases, to make up for the deficiency, it was necessary to use paraphrase. Dr. Abel then pointed out that only thoughts common to a whole nation, or to large sections of a nation, are embodied in single words, and hence drew the conclusion that the finer shades of national character are most effectually ascertained by a comparison of synonyms.

## QUEKETT MICROSCOPICAL.

MAY 28.—Dr. T. S. Cobbold, President, in the chair.—Four new members were elected.—The list of donations included a series of twenty slides of the genus Pulex, also a remarkably large specimen of the same genus, species undescribed.—Dr. M. C. Cooke read a paper on "The Results of some of the Field Excursions of the Society," with classified lists of objects found. A discussion followed as to the best means of collating and preserving lists of similar kinds during successive seasons, as contributions towards the knowledge of the distribution of the microscopic Fauna and Flora of the London district.—Mr. A. D. Michael read a paper on "Two Species of Acarina not hitherto recorded as British."

## ANTHROPOLOGICAL INSTITUTE.

MAY 25.—E. B. Tylor, Esq., President, in the chair.—Mr. H. Woodward read extracts from a paper by Prof. J. Milne, on "The Stone Age in Japan." The author described from personal examination many of the archæological remains in Japan. "Kitchen middens are abundant, and are ascribed to the Ainos, the ornamentation on the pottery resembling that still used by the Ainos of to day. The shells and bones found in the middens were enumerated and described. The stone implements found in Japan include axes, arrow-heads, and scrapers. Many of these occur in the middens; the axes are formed generally of a greenish stone, which appears to be a decomposed trachytic porphyry or andesite. The Ainos used stone implements up to a comparatively modern date. Tumuli occur in many parts of Japan, as well as caves, both natural and artificial. Prof. Milne opened one of the latter, and found the interior covered with inscriptions. The Japanese themselves make valuable collections of stone implements, old pottery, &c., the favourite notion among them being that such things were freaks of nature. Several fragments of pottery, shells, and other remains from kitchen middens were exhibited.—Mr. C. Pfoundes read a paper on "The Japanese People, their Origin, and the Race as it now Exists." Passing over the fabulous period, we find the Japanese commence their era about the same time as that of Rome, B.C. 660; the first emperor, mikado, or ruler established himself in the vicinity of Kiote, not very far from the present treaty ports, Osaka-Kiogo. For centuries history teems with accounts of efforts to civilise the people, and the wild and intractable aborigines were gradually driven northward, until they settled in the North Island, where they still exist, and form the bulk of the present inhabitants. Mr. Pfoundes exhibited a valuable collection of photographs and drawings in illustration of his paper, together with articles of Japanese manufacture and some fine specimens of tapestry.

## SOCIETY OF BIBLICAL ARCHÆOLOGY.

JUNE 1.—Mr. W. Morrison in the chair.—Lieut.-Col. Warren read a paper on "The Site of the Temples of the Jews at Jerusalem."

## MINERALOGICAL SOCIETY.

JUNE 1.—Prof. T. G. Bonney, V.P., in the chair.—The following papers were read: on "A New Face on Crystals of Stilbite from Scotland and Western Australia," by the President; on "A Portable Chemical Cabinet for Quantitative Work," by Mr. A. E. Arnold; and on "Kaolinite and Kaolin," by Mr. J. H. Collins; on "New Scottish Minerals," by Prof. Heddle; and "Further Notes on Mineral Growth," by Mr. T. A. Readwin.—Interesting specimens of minerals were exhibited by Messrs. F. W. Rudler, T. A. Readwin, J. R. Gregory, and W. Semmons.—Messrs. G. N. Walker, A. Murray, G. S. Mackenzie, and H. Furnhjelm were elected ordinary members, and Mr. R. M. Heddle an associate.

## ROYAL INSTITUTION.

JUNE 7.—G. Busk., Esq., Treas. and V.P., in the chair.—Dr. C. A. Gordon, Dr. A. C. Macrae, Dr. C. M. Tidy, Messrs. T. Forster, J. Steel, W. S. Steel, and A. Taylor were elected members.

## MUSICAL ASSOCIATION.

JUNE 7.—W. H. Cummings, Esq., in the chair.—Prof. Macfarren delivered an address on the subject of the "Lyrical Drama." In the course of a lecture of exceptional interest, the professor traced the progress of song in connection with the drama, from its earliest rudimentary form in the Greek drama, through the first Christian Passion plays, to the period of the Renaissance, dwelling somewhat afterwards on many individual composers, as Monteverde, Scarlatti, Lulli, Purcell, Keiser, Handel, Gluck, Mozart, &c., pointing out each of the more important steps in the growth of the lyrical drama, and illustrating his subject by examples so admirably selected and vividly described that the audience (without a note of music) were able to follow Dr. Macfarren's arguments and deductions with ease and pleasure.

## LIBRARY ASSOCIATION.

JUNE 4.—Prof. Jevons in the chair.—Mr. C. Walford read a paper entitled "Books I have seen, Books I have not Seen, Books I should like to See, Books I never expect to See." In the first category he placed a work which for a long time he thought would belong to the last. It was the first book that Benjamin Franklin printed, and is entitled "Ways and Means for the People of Delaware to become Rich, 1725." Written by Mr. Francis Rawle, member of an old Cornish family, it contains many useful hints on insurance, saving, and other branches of political economy; but, being no larger than a pamphlet, it gradually disappeared from the book market, and only two copies were known to exist, one in Philadelphia and one in the British Museum. Neither of these was Mr. Walford able to see; but, fortunately for him, Mr. W. B. Rawle, a descendant of the author, had reprinted the tract in a small edition, and presented Mr. Walford with a copy, which was exhibited at the meeting. Other curious pamphlets on plagues, the Fire of London, comets, usury, &c., were exhibited, and illustrated by notes historical and critical; but to exhaust the subjects of his paper the reader said would require the patient indulgence of his audience at a future meeting.

## ENGLISH SPELLING REFORM ASSOCIATION.

JUNE 1.—Mr. A. J. Ellis in the chair.—Mr. F. G. Fleay read a paper in which he examined upon general principles how a European alphabet could best be formed, and in what way a reformed English alphabet would best lead up to it. The results obtained were that only vowels admit of systematic treatment on the basis of the Latin alphabet; that three new vowel types would be sufficient for our language, and that one modifying mark should be used to distinguish wide from narrow vowels (in English this is nearly the same as long from short vowels), while for consonants six new types would have to be introduced. For present use as an introductory system one new type and one modifying sign would be sufficient. A further examination of proposed methods showed that diacritics, cut or turned letters, were undesirable; that new digraphs should not be introduced, and old ones only temporarily retained. New types must ultimately be introduced, except for the distinction of vowel classes, which could be indicated by a modifier.—The reading of the paper was followed by a long and animated discussion.

JUNE 28.—Annual meeting.—Dr. W. H. Hunter in the chair.—The report stated that considerable progress had been made in the classification of schemes of spelling reform, and in making the subject known to the public.

BRITISH 11 OC 80 MUSEUM

## STATISTICAL SOCIETY.

JUNE 15.—Dr. William A. Guy, F.R.S., in the chair.—The following gentlemen were elected Fellows: Right Hon. J. Chamberlain, Hon. W. Egerton, Messrs. S. Leighton, C. Schreiber, J. W. Pease, R. J. More, W. L. Jackson, G. Readdy, W. S. Caine, J. C. Bolton, W. Y. Craig, J. Lovegrove, G. H. Finch, J. Rankin, C. Seeley, jun., and C. H. Crompton-Roberts; and the under-mentioned were elected honorary members of the society: His Excellency M. Léon Say, the Hon. Charles F. Conant, and M. le Dr. J. Bertillon.—The paper read was by Mr. R. P. Williams, on "The Increase of Population in England and Wales."

## NEW SHAKSPERE.

JUNE 11.—Mr. Furnivall, Director, in the chair.—The Rev. H. N. Ellacombe read a paper on "The Seasons of Shakspeare's Plays." He found the seasons marked in eight comedies, five histories, and eight tragedies, by mentions of flowers, plants, or other indications. For instance, in the "Midsummer Night's Dream," though its days were April 29th, 30th, and May 1st, its English flowers were midsummer ones; and the distinction was worth noting between the "blowing" of the wild thyme, which would be then at its fullest, and the "growing" of the oxlips and the violet, which had passed their time of blowing, but the living plants continued "growing." In the "Winter's Tale" the flowers named are all summer flowers, carnations or gilliflowers, lavender, mints, savory, marjoram, and marigold. And so with other plays.—Mr. Furnivall read a paper on "The Failure of Mr. Swinburne's Metrical Argument against Fletcher's Share in 'Henry VIII.'" The argument was that Fletcher did not write the share assigned to him because it did not contain "the perpetual predominance of those triple terminations so peculiarly dear to Fletcher." But this argument was absolutely worthless as a test of Fletcher's work, because the share in "The Two Noble Kinsmen" which Mr. Swinburne and other critics assigned to Fletcher contained far fewer of these triple endings than his share in "Henry VIII.," a fact which Mr. Swinburne had forgotten to find out before bringing forward his argument.—The Rev. J. Kirkman read a paper on "Suicide in Shakspeare."

WE notice in the *Scientific American* of June 26th, a description and illustration of a so-called new invention for ventilation of boots and shoes patented in America by a Mr. McDonald. This invention is, we think, an exact counterpart of a patent secured in England by George Smith, dated January 7, 1873, No. 70. It seems very peculiar that in the face of this patent the examiner should allow a patent to issue seeing that in the case of English inventors applying for U.S. patents, not only are direct similarities adverted to, but very indirect or side issues are brought in question rather than main facts.

GOLD MINING IN ENGLAND.—Gold in unworkable quantities has frequently been found in this country, and considerable excitement just now exists in the neighbourhood of the Kildonan gold-diggings, Sutherlandshire, in consequence of the active steps now being taken for thoroughly testing the gold-producing properties of quartz taken from various points in the strath. It appears that a German chemist of much experience has discovered a process which gives excellent results. It is almost entirely chemical, and costs but little to carry on. Australian miners express their astonishment at the striking resemblance between the Sutherland and the Australian gold-fields.